JOURNAL OF THE ASSOCIATION FOR COMPUTING MACHINERY

VOLUME 31 • 1984

Editor-in-Chief Michael J. Fischer

Associate Director of Publications

Janet G. Benton

Area Editors Edward G. Coffman, Jr.

Peter J. Downey

Stanley C. Eisenstat

David S. Johnson

Stephen S. Lavenberg

Jan Karel Lenstra

Christos H. Papadimitriou

Daniel J. Rosenkrantz

Robert Sedgewick

Lawrence Snyder

N. S. Sridharan

Andrew C.-C. Yao

Department of Computer Science/Yale University/P.O. Box 2158/New Haven, CT 06520

ACM Headquarters/11 West 42nd Street/New York, NY 10036/212-869-7440

AT&T Bell Laboratories, Inc./600 Mountain Avenue/ Murray Hill, NJ 07974 (Operating Systems) Department of Computer Science/The University of Arizona/ Tucson, AZ 85721

(Programming Languages and Methodology)
Department of Computer Science/Yale University/P.O. Box
2158/New Haven, CT 06520 (Numerical Computation)
AT&T Bell Laboratories, Inc./600 Mountain Avenue/
Murray Hill, NJ 07974 (Combinatorics and Graph Theory)
IBM T. J. Watson Research Center/P. O. Box 218/
Yorktown Heights, NY 10598

(Computer System Modeling and Analysis)
Department of Operations Research and System Theory,
Centre for Mathematics and Computer Science/P. O. Box
4079/1009 AB Amsterdam/The Netherlands

(Operations Research)
Computer Science Department/Stanford University/
Stanford, CA 94305 (Database Theory)
Department of Computer Science/The State University of
New York at Albany/Albany, NY 12222

(Formal Languages and Models of Computation)
Department of Computer Science/Brown University/Box
1910/Providence, RI 02912

(Data Structures and Analysis of Algorithms)
Department of Computer Science/FR-35/University of
Washington/Seattle, WA 98195

(Computer Organization and Parallel Processing)
Bolt, Beranek and Newman, Inc./10 Moulton Street/
Cambridge, MA 02138 (Artificial Intelligence)

Computer Science Department/Stanford University/ Stanford, CA 94305 (Complexity of Algorithms)

SUBJECT INDEX

	677	information for Authors
ARTIFICIAL INTELLIGENCE	441	Robert S. Boyer and J Strother Moore—A Mechanical Proof of the Unsolvability of the Halting Problem
***************************************	1	Robert E. Shostak—Deciding Combinations of Theories
CIRCUIT DESIGN	13	H. J. Hoover, M. M. Klawe, and N. J. Pippenger—Bounding Fan-Out in Logical Networks
COMBINATORICS AND GRAPH THEORY	19	Peter Eades, Michael Hickey, and Ronald C. Read—Some Hamilton Paths and a Minimal Change Algorithm
	459	Yuri Gurevich, Larry Stockmeyer, and Uzi Vishkin—Solving NP-Hard Prob- lems on Graphs That Are Almost Trees and an Application to Facility Location Problems
	681	S. G. Williamson-Depth-First Search and Kuratowski Subgraphs
COMPUTER SYSTEMS	474	François Baccelli, Erol Gelenbe, and Brigitte Plateau—An End-to-End Approach to the Resequencing Problem
	486	Ajoy Datta and S. Ghosh-Synthesis of a Class of Deadlock-Free Petri Nets
	193	Allen Gottlieb and Clyde P. Kruskal—Complexity Results for Permuting Data and Other Computations on Parallel Processors
	694	Jonathan W. Greene and Abbas El Gamal—Configuration of VLSI Arrays in the Presence of Defects
	507	Eli Upfal-Efficient Schemes for Parallel Communication
DATABASE THEORY	30	Catriel Beeri, Martin Dowd, Ronald Fagin, and Richard Statman—On the Structure of Armstrong Relations for Functional Dependencies
	718	Catriel Beerl and Moshe Y. Vardi-A Proof Procedure for Data Dependencies
	742	Stavros S. Cosmadakis and Christos H. Papadimitriou—Updates of Relational Views
	47	Lawrence J. Henshen and Shamim A. Naqvi—On Compiling Queries in Recursive First-Order Databases
	210	Richard Hull-Finitely Specifiable Implicational Dependency Families
	518	Richard Hull and Chee K. Yap—The Format Model: A Theory of Database Organization
	761	Tomasz Imieliński and Witold Lipski, Jr.—Incomplete Information in Rela- tional Databases
	227	Mihalis Yannakakis-Serializability by Locking
DATA STRUCTURES AND ALGORITHMS	538	Michael J. Fredman, János Komlós, and Endre Szemerédi—Storing a Sparse Table with O(1) Worst Case Access Time
	245	Robert E. Tarjan and Jan van Leeuwen—Worst-Case Analysis of Set Union Algorithms
FORMAL LANGUAGES	282	Karel Culik II and Tero Harju—The ω-Sequence Equivalence Problem for DOL Systems is Decidable
	299	H. B. Hunt III—Terminating Turing Machine Computations and the Complexity and/or Decidability of Correspondence Problems, Grammars, and Program Schemes
NUMERICAL COMPUTATION	792	 A. Bojańcyzk—Optimal Asynchronous Newton Method for the Solution of Nonlinear Equations
	319	C. W. Clenshaw and F. W. J. Olver-Beyond Floating Point
	804	PJ. Courtois and P. Semal—Bounds for the Positive Eigenvectors of Nonnegative Matrices and for Their Approximations by Decomposition
	545	J. F. Traub and H. Woźniakowski—On the Optimal Solution of Large Linear Systems
	329	George M. Trojan—Lower Bounds and Fast Algorithms for Sequence Acceleration
OPERATING SYSTEMS	86	Aurel A. Lazar—Optimal Flow Control of an M/M/m Queue

OPERATIONS RESEARCH	99	Sidnle Dresher Feit—A Fast Algorithm for the Two-Variable Integer Programming Problem
	114	Nimrod Meggido—Linear Programming in Linear Time When the Dimension is Fixed
	336	Hans Röck-The Three-Machine No-Wait Flow Shop Is NP-Complete
PROGRAMMING ANGUAGES AND	500 600	S. D. Brookes, C. A. R. Hoare, and A. W. Roscoe—A Theory of Communicating Sequential Processes
METHODOLOGY		John McLean-A Formal Method for the Abstract Specification of Software
SYSTEM MODELING AND ANALYSIS	128	O. J. Boxma, F. P. Kelly, and A. G. Konheim—The Product Form for Sojourn Time Distributions in Cyclic Exponential Queues
	826	A. R. Calderbank, E. G. Coffman, Jr., and L. Flatto—Optimum Head Separation in a Disk System with Two Read/Write Heads
	628	Micha Hofri—Analysis of Interleaved Storage via a Constant-Service Queuing System with Markov-Chain-Driven Input
	346	J. McKenna and Debesis Mitra—Asymptotic Expansions and Integral Representations of Moments of Queue Lengths in Closed Markovian Networks
	839	Benjamin Melamed and Micha Yadin—Numerical Computation of Sojourn- Time Distributions in Queuing Networks
	855	Debasis Mitra and P. J. Weinberger—Probablistic Models of Database Locking: Solutions, Computational Algorithms, and Asymptotics
	134	B. Simon—Priority Queues with Feedback
THEORY OF COMPUTATION	361	Akeo Adachi and Shigeki Iwata—Some Combinatorial Game Problems Require $\Omega(n^h)$ Time
	649	Mikhail Ataliah and S. Rao Kosaraju—Graph Problems on a Mesh-Connected Processor Array
	879	P. A. Bloniarz, H. B. Hunt III, and D. J. Rosenkrantz—Algebraic Structures with Hard Equivalence and Minimization Problems
	377	Joseph Ja' Ja'-The VLSI Complexity of Selected Graph Problems
	:50	J. Ja' Ja' and V. K. Prasanna Kumar—Information Transfer in Distributed Computing with Applications to VLSI
	668	Friedheim Meyer auf der Heide—A Polynomial Linear Search Algorithm for the n-Dimensional Knapsack Problem
	905	J. Pachl, E. Korach, and D. Rotem—Lower Bounds for Distributed Maximum- Finding Algorithms
	392	Christos H. Papadimitriou-On the Complexity of Unique Solutions
	401	John H. Reif-Symmetric Complementation
	422	John E. Savage-Space-Time Trade-Offs for Banded Matrix Problems
	163	Douglas R. Smith—Random Trees and the Analysis of Branch and Bound Procedures

AUTHOR INDEX

ADACHI, AKEO	361	Some Combinatorial Game Problems Require $\Omega(n^k)$ Time
ATALLAH, MIKHAIL J.	649	Graph Problems on a Mesh-Connected Processor Array
BACCELLI, FRANÇOIS	474	An End-to-End Approach to the Resequencing Problem
BEERI, CATRIEL	30	On the Structure of Armstrong Relations for Functional Dependencies
	718	A Proof Procedure for Data Dependencies
BLONIARZ, P. A.	879	Algebraic Structures with Hard Equivalence and Minimization Problems
BOJAŃCYZK, A	792	Optimal Asynchronous Newton Method for the Solution of Nonlinear Equations
BOXMA, O. J.	128	The Product Form for Sojourn Time Distributions in Cyclic Exponential Queues
BOYER, ROBERT S.	441	A Mechanical Proof of the Unsolvability of the Halting Problem
BROOKES, S. D.	560	A Theory of Communicating Sequential Processes
CALDERBANK, A. R.	826	Optimum Head Separation in a Disk System with Two Read/Write Heads
CLENSHAW, C. W.	319	Beyond Floating Point
COFFMAN, E. G., JR.	826	See Calderbank, A. R.
COSMADAKIS, STAVROS S.	742	Updates of Relational Views
COURTOIS, PJ.	804	Bounds for the Positive Eigenvectors of Nonnegative Matrices and for Their Approximations by Decomposition
CULIK, KAREL II	282	The ω -Sequence Equivalence Problem for D0L Systems Is Decidable
DATTA, AJOY	486	Synthesis of a Class of Deadlock-Free Petri Nets
DOWD, MARTIN	30	See Beeri, Catriel. On the Structure of Armstrong Relations for Functional Dependencies
EADES, PETER	19	Some Hamilton Paths and a Minimal Change Algorithm
EL GAMAL, ABBAS	694	See Greene, Jonathan W.
FAGIN, RONALD	30	See Beeri, Catriel. On the Structure of Armstrong Relations for Functional Dependencies
FEIT, SIDNIE DRESHER	99	A Fast Algorithm for the Two-Variable Integer Programming Problem
FLATTO, L	826	See Calderbank, A. R.
FREDMAN, MICHAEL L.	538	Storing a Sparse Table with O(1) Worst Case Access Time
GELENBE, EROL	474	See Baccelli, François
GHOSH S.	486	See Datta, Ajoy
GOTTLIEB, ALLEN	193	Complexity Results for Permuting Data and Other Computations on Parallel Processors
GREENE, JONATHAN W.	694	Configuration of VLSI Arrays in the Presence of Defects
GUREVICH, YURI	459	Solving NP-Hard Problems on Graphs That Are Almost Trees and an Appli- cation to Facility Location Problems
HARJU, TERO	282	See Culik, Karel II
HENSHEN, LAWRENCE J.	47	On Compiling Queries in Recursive First-Order Databases
HICKEY, MICHAEL	19	See Eades, Peter
HOARE, C. A. R.	560	See Brookes, S. D.
HOFRI, MICHA	628	Analysis of Interleaved Storage via a Constant-Service Queuing System with Markov-Chain-Driven Input
HOOVER, H. J.	13	Bounding Fan-Out in Logical Networks
HULL, RICHARD	210	Finitely Specifiable Implicational Dependency Families
	518	The Format Model: A Theory of Database Organization
HUNT, H. B. III	299	Terminating Turing Machine Computations and the Complexity and/or De- cidability of Correspondence Problems, Grammars, and Program Schemes
	879	See Bloniarz, P. A.
IMIELIŃSKI, TOMASZ	761	Incomplete Information in Relational Databases
IWATA, SHIGEKI	361	See Adachi, Akeo

141 141 1	450	Information Tempologic Statistics and Committee and Australia
JA' JA', J.	150 377	Information Transfer in Distributed Computing with Applications to VLSI
KELLY, F. P.	128	The VLSI Complexity of Selected Graph Problems See Boxma, O. J.
KLAWE, M. M.	13	See Hoover, H. J.
KOMLÓS, JÁNOS	538	See Fredman, Michael L.
KONHEIM, A. G.	128	See Boxma. O. J.
KORACH, E.	905	See Pachl, J.
KOSARAJU, S. RAO	649	See Ataliah, Mikhail J.
KRUSKAL, CLYDE, P.	193	See Gottlieb, Allan
LAZAR, AUREL A.	86	Optimal Flow Control of an M/M/m Queue
LIPSKI, WITOLD, JR.	761	See Imieliński, Tomasz
McKENNA, J.	346	Asymptotic Expansions and Integral Representations of Moments of Queue Lengths in Closed Markovian Networks
McLEAN, JOHN	600	A Formal Method for the Abstract Specification of Software
MEGGIDO, NIMROD	114	Linear Programming in Linear Time When the Dimension Is Fixed
MELAMED, BENJAMIN	839	Numerical Computation of Sojourn-Time Distributions in Queuing Networks
MEYER AUF DER HEIDE, FRIEDHELM	668	A Polynomial Linear Search Algorithm for the n-Dimensional Knapsack Problem
MITRA, DEBASIS	346	See McKenna, J.
	855	Probablistic Models of Database Locking: Solutions, Computational Algorithms, and Asymptotics
MOORE, J STROTHER	441	See Boyer, Robert S.
NAQVI, SHAMIMA, A.	47	See Henshen, Lawrence J.
OLVER, F. W. J.	319	See Clenshaw, C. W.
PACHL, J.	905	Lower Bounds for Distributed Maximum-Finding Algorithms
PAPADIMITRIOU,	392	On the Complexity of Unique Solutions
CHRISTOS H.	742	See Cosmadakis, Stavros S.
PIPPENGER, N. J.	13	See Hoover, H. J.
PLATEAU, BRIGITTE	474	See Baccelli, François
PRASANNA KUMAR, V. K.	150	See Ja' Ja', J. Information Transfer in Distributed Computing with Applica- tions to VLSI
READ, RONALD C.	19	See Eades, Peter
REIF, JOHN H.	401	Symmetric Complementation
RÖCK, HANS	336	The Three-Machine No-Wait Flow Shop Is NP-Complete
ROSCOE, A. W.	560	See Brookes, S. D.
ROSENKRANTZ, D. J.	879	See Bloniarz, P. A.
ROTEM, D.	90F	See Pachi, J.
SAVAGE, JOHN E.	422	Space-Time Trade-Offs for Banded Matrix Problems
SEMAL, P.	804	See Courtois, PJ.
SHOSTAK, ROBERT E.	1	Deciding Combinations of Theories
SIMON, B.	134	Priority Queues with Feedback
SMITH, DOUGLAS R.	163	Random Trees and the Analysis of Branch and Bound Procedures
STATMAN, RICHARD	30	See Beeri, Catriel. On the Structure of Armstrong Relations for Functional Dependencies
STOCKMEYER, LARRY	459	See Gurevich, Yuri
SZEMERÉDI, ENDRE	538	
TARJAN, ROBERT E.	245	
TRAUB, J. F.	545	
TROJAN, GEORGE M.	329	Lower Bounds and Fast Algorithms for Sequence Acceleration
UPFAL, ELI	507	
VAN LEEUWEN, JAN	245	
VARDI, MOSHE Y.	718	See Beerl, Catriel. A Proof Procedure for Data Dependencies

VISHKIN, UZI 459 See Gurevich, Yuri
WEINBERGER, P. J. 855 See Mitra, Debasis
WILLIAMSON, S. G. 681 Depth-First Search and Kuratowski Subgraphs
WOŹNIAKOWSKI, H. 545 See Traub, J. F.
YADIN, MICHA 839 See Metamed, Benjamin
YANNAKAKIS, MIHALIS 227 See Hull, Richard. The Format Model: A Theory of Database Organization

